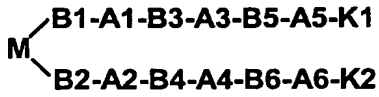
Patent Claims

1. Compounds of formula I

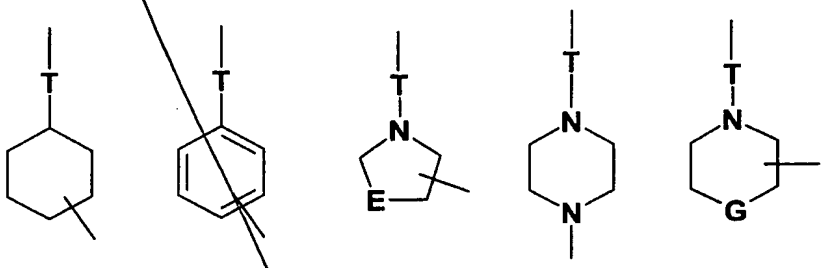


(I)

in which

A1 and A2 are identical or different and are -C(O)-, -NH-, -O- (oxygen), -S- (sulfur), $-S(O)_2-$, $-S(O)_2-NH-$, $-NH-S(O)_2-$, -C(O)-NH-, -NH-C(O)-, -O-C(O)-, -C(O)-O- or a bond,

A3 and A4 are identical or different and are -C(O)-, -O-, -S-, -NH-, -O-C(O)-, -C(O)-O-, -C(O)-NH-, -NH-C(O)- or a bond, or are selected from the group consisting of



where

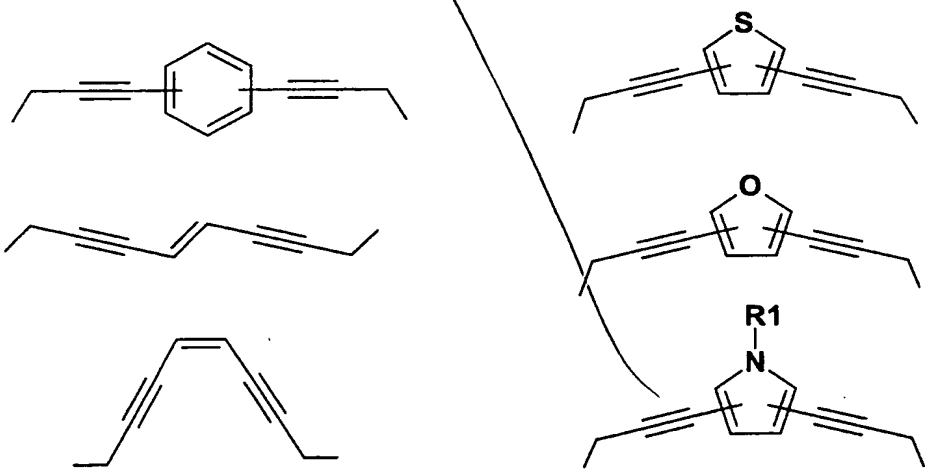
E is -O- (oxygen), -S- (sulfur) or $-CH_2-$ (methylene),

G is -O- (oxygen) or $-CH_2-$ (methylene), and

T is the group -C(O)- or a bond,

A5 and A6 are identical or different and are -C(O)-, -NH-, -O-, -S-, -C(O)-NH-, -NH-C(O)-, -O-C(O)-, -C(O)-O-, -NH-C(O)-NH- or a bond,

M is a central building block selected from the group below



where

R1 is hydrogen, 1-4C-alkyl or 1-4C-alkylcarbonyl,

K1 is -B7-$(C(O))_m$-B9-X1, -B7-$(C(O))_m$-B9-Y1 or -B7-$(C(O))_m$-B9-Z1-B11-X1,

K2 is -B8-$(C(O))_p$-B10-X2, -B8-$(C(O))_p$-B10-Y2 or -B8-$(C(O))_p$-B10-Z2-B12-X2,

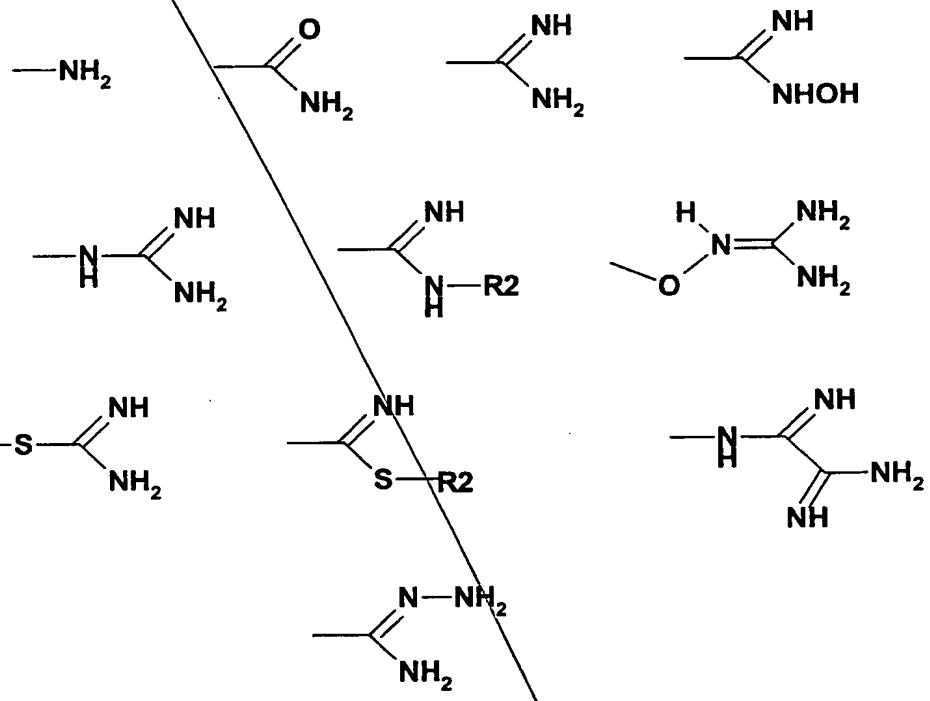
B1, B2, B3, B4, B5 and B6 are identical or different and are a bond or 1-4C-alkylene,

B7, B8, B9, B10, B11 and B12 are identical or different and are a bond or 1-4C-alkylene,

m is 0 or 1,

p is 0 or 1,

X1 and X2 are identical or different and are selected from the group consisting of



where

R2 is 1-4C-alkyl,

Y1 and Y2 are identical or different and are a 4-11C-heteroaryl or 2-7C-heterocycloalkyl radical containing at least one ring nitrogen,

Z1 and Z2 are identical or different and are 5-12C-arylene, 5-12C-heteroarylene, 3-8C-cycloalkylene or 3-8C-heterocycloalkylene,

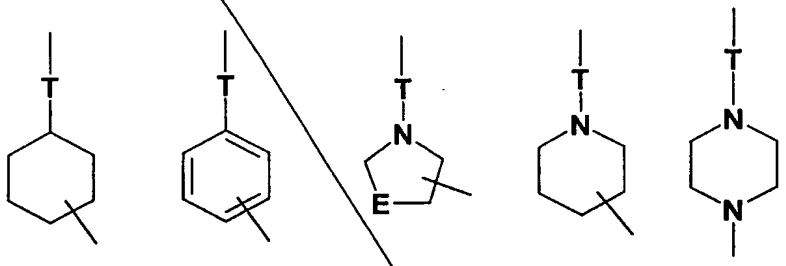
where each arylene, heteroarylene, cycloalkylene, heterocycloalkylene, heteroaryl or heterocycloalkyl may additionally for its part be substituted by one, two or three substituents selected from the group consisting of hydroxyl, halogen, nitro, cyano, amino, 1-4C-alkyl, 1-4C-alkoxy, 1-4C-alkoxycarbonyl, 1-4C-alkylcarbonyloxy, carboxyl or aminocarbonyl,

and where on the direct rout between the terminal nitrogen atoms 20 to 40 bonds have to be present, the salts of these compounds, and the N-oxides of the nitrogen-containing heteroaryls, heterocycloalkyls, heteroarylenes and heterocycloalkylenes, and their salts, where all those compounds are excluded in which one or more of the variables B1, B2, B3, B4, B5, B6, B7, B8, B9, B10, B11 or B12 may assume the meaning of a bond resulting in the direct linkage of two heteroatoms or two carbonyl groups.

2. Compounds of formula I according to claim 1 in which

A1 and A2 are identical or different and are -C(O)-, -NH-, -O-, -C(O)-NH-, -NH-C(O)-, -O-C(O)-, -C(O)-O- or a bond,

A3 and A4 are identical or different and are -C(O)-, -O-, -NH-, -O-C(O)-, -C(O)-O-, -C(O)-NH-, -NH-C(O)- or a bond, or are selected from the group consisting of



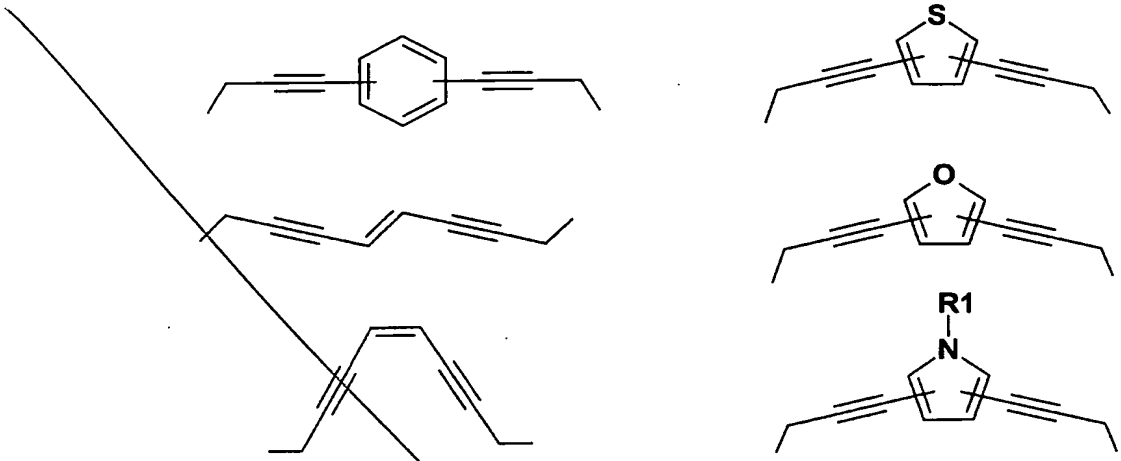
where

E is -O- (oxygen), -S- (sulfur) or -CH_2- (methylene) and

T is the group -C(O)- or a bond,

A5 and A6 are identical or different and are -C(O)-, -NH-, -O-, -C(O)-NH-, -NH-C(O)-, -O-C(O)-, -C(O)-O-, -NH-C(O)-NH- or a bond,

M is a central building block selected from the group below



Sub A1

where

R1 is hydrogen, 1-4C-alkyl or 1-4C-alkylcarbonyl,

K1 is -B7-$(C(O))_m$-B9-X1, -B7-$(C(O))_m$-B9-Y1 or -B7-$(C(O))_m$-B9-Z1-B11-X1,

K2 is -B8-$(C(O))_p$-B10-X2, -B8-$(C(O))_p$-B10-Y2 or -B8-$(C(O))_p$-B10-Z2-B12-X2,

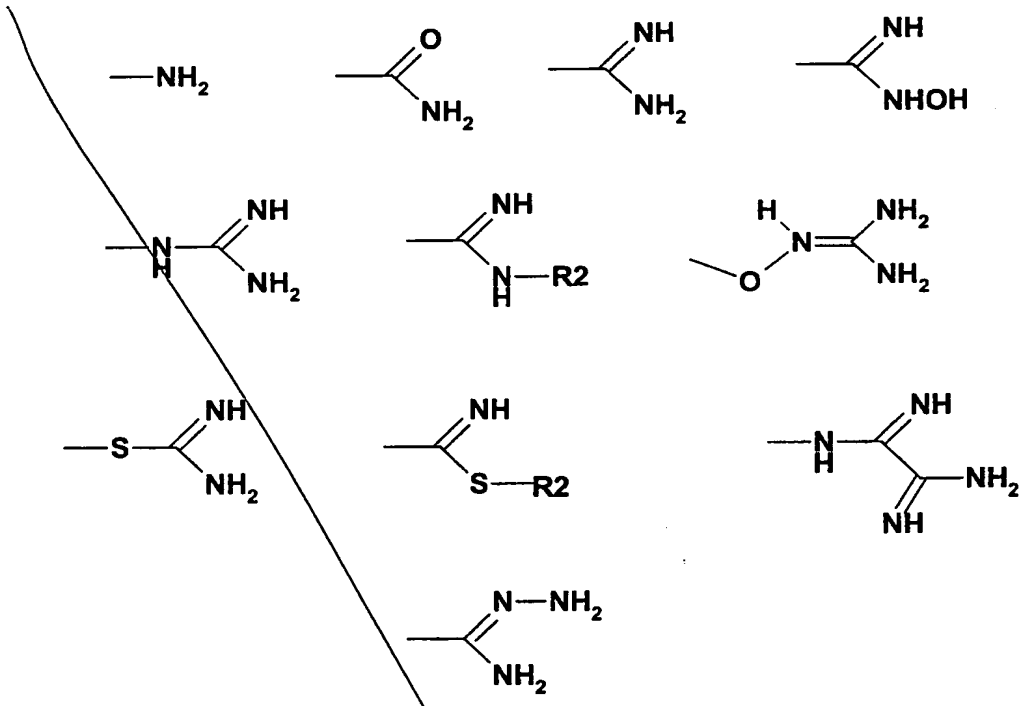
B1, B2, B3, B4, B5 and B6 are identical or different and are a bond or 1-4C-alkylene,

B7, B8, B9, B10, B11 and B12 are identical or different and are a bond or 1-4C-alkylene,

m is 0 or 1,

p is 0 or 1,

X1 and X2 are identical or different and are selected from the group consisting of



where

R2 is 1-4C-alkyl,

Y1 and Y2 are identical or different and are piperid-4-yl, piperid-3-yl, piperazin-1-yl, piperazin-2-yl, morpholin-2-yl, pyrrolidin-2-yl, pyrrolidin-3-yl, imidazolidin-1-yl, imidazolidin-2-yl, imidazolidin-4-yl, 2-imidazolin-3-yl, 2-imidazolin-2-yl, imidazol-1-yl, imidazol-2-yl, imidazol-4-yl, pyrid-4-yl, pyrid-3-yl, pyridazin-4-yl, pyrimidin-5-yl, pyrimidin-4-yl, indol-3-yl, benzimidazol-4-yl or benzimidazol-5-yl,

Z1 and Z2 are identical or different and are 1,4-phenylene, 1,3-phenylene, 1,4-naphthylene, 2,6-naphthylene, 1,4-cyclohexylene, 1,3-cyclohexylene, 1,3-cyclopentylene, 1,4-piperazinylene, 4,1-piperidinylene, 1,4-piperidinylene, 2,5-pyrrolidinylene, 4,2-imidazolidinylene, 2,5-furylene, 2,5-pyrrolylene, 4,2-pyridylene, 5,2-pyridylene, 2,5-indolylene, 2,6-indolylene, 3,5-indolylene, 3,6-indolylene, 3,5-indazolylene, 3,6-indazolylene, 2,6-quinolinylene, 2,5-benzofuranylene or 4,2-thiazolylene,

where each arylene, heteroarylene, cycloalkylene, heterocycloalkylene, heteroaryl or heterocycloalkyl may additionally for its part be substituted by one, two or three substituents selected from the group consisting of hydroxyl, halogen, nitro, cyano, amino, 1-4C-alkyl, 1-4C-alkoxy, 1-4C-alkoxycarbonyl, 1-4C-alkylcarbonyloxy, carboxyl or aminocarbonyl,

and where on the direct route between the terminal nitrogen atoms 20 to 40 bonds have to be present, the salts of these compounds, and the N-oxides of the nitrogen-containing heteroaryls, heterocycloalkyls, heteroarylenes and heterocycloalkylenes, and their salts, where all those compounds are excluded in which one or more of the variables B1, B2, B3, B4, B5, B6, B7, B8, B9, B10, B11 or B12

may assume the meaning of a bond, resulting in the direct linkage of two heteroatoms or carbonyl groups.

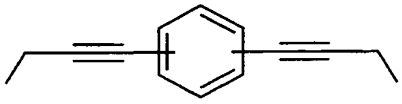
3. Compounds of formula I according to claim 1 in which

A1 and A2 are identical or different and are -O-, -C(O)-, -O-C(O)-, -NH-C(O)- or a bond,

A3 and A4 are identical or different and are 1,4-piperazinylene, 1,4-piperidinylene, 1,4-cyclohexylene, 1,3-phenylene or a bond,

A5 and A6 are identical or different and are -C(O)-, -C(O)-NH-, -NH-C(O)- or -NH-C(O)-NH-,

M is a central building block selected from the group below



K1 is -B7-$(C(O))_m$-B9-Y1 or -B7-$(C(O))_m$-B9-Z1-B11-X1,

K2 is -B8-$(C(O))_p$-B10-Y2 or -B8-$(C(O))_p$-B10-Z2-B12-X2,

B1 and B2 are identical or different and are a bond or methylene,

B3, B4, B5 and B6 are identical or different and are a bond or 1-3C-alkylene,

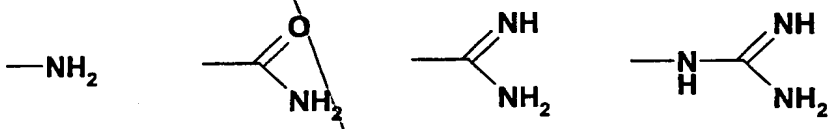
B7, B8, B9 and B10 are identical or different and are a bond or 1-4C-alkylene,

B11 and B12 are identical or different and are a bond or methylene,

m is 0,

p is 0,

X1 and X2 are identical or different and are selected from the groups below



Y1 and Y2 are imidazol-1-yl,

Z1 and Z2 are identical or different and are 5,2-pyridinylene, 6-methyl-5,2-pyridinylene, 4,1-piperidinylene, 3,6-indazolylene, 3,6-indolylene, 1,3-phenylene, 1,4-phenylene, 1,3-cyclohexylene or 1,4-cyclohexylene,

and where on the direct route between the terminal nitrogen atoms 20 to 40 bonds have to be present, the salts of these compounds, and also the N-oxides of the nitrogen-containing heteroaryls, heteroarylenes and heterocycloalkylenes, and their salts, where all those compounds are excluded in which one or more of the variables B1, B2, B3, B4, B5, B6, B7, B8, B9, B10, B11 or B12 may assume the meaning of a bond, resulting in the direct linkage of two heteroatoms or carbonyl groups.

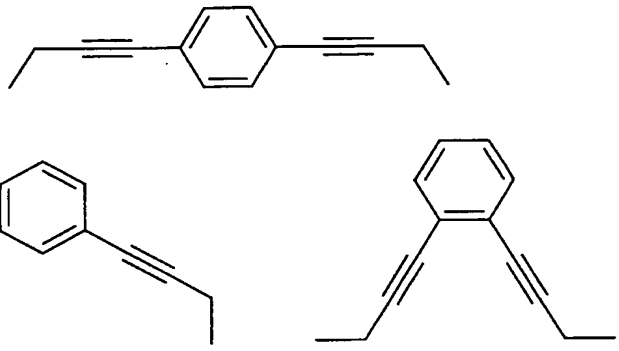
4. Compounds of formula I according to claim 1 in which

A1 and A2 are -O-C(O)-,

A3 and A4 are 1,4-piperazinylene,

A5 and A6 are identical or different and are -C(O)- or -C(O)-NH-,

M is a central building block selected from the groups below



K1 is -B7-$(C(O))_m$-B9-Z1-B11-X1,

K2 is -B8-$(C(O))_p$-B10-Z2-B12-X2,

B1, B2, B3, B4, B5 and B6 are a bond,

B7 and B8 are identical or different and are a bond or methylene,

B9 and B10 are a bond,

B11 and B12 are methylene,

m is 0,

p is 0,

X1 and X2 are amino,

Z1 and Z2 are identical or different and are 1,4-phenylene or 1,4-cyclohexylene,

and the salts of these compounds.

5. Compounds of formula I according to claim 1 with the chemical name

1,2-bis[4-(trans-4-aminomethylcyclohexylcarbonyl)-1-piperazinylcarbonyl-1-oxyprop-2-ynyl]benzene;

1,4-bis[4-(trans-4-aminomethylcyclohexylcarbonyl)-1-piperazinylcarbonyl-1-oxyprop-2-ynyl]benzene;

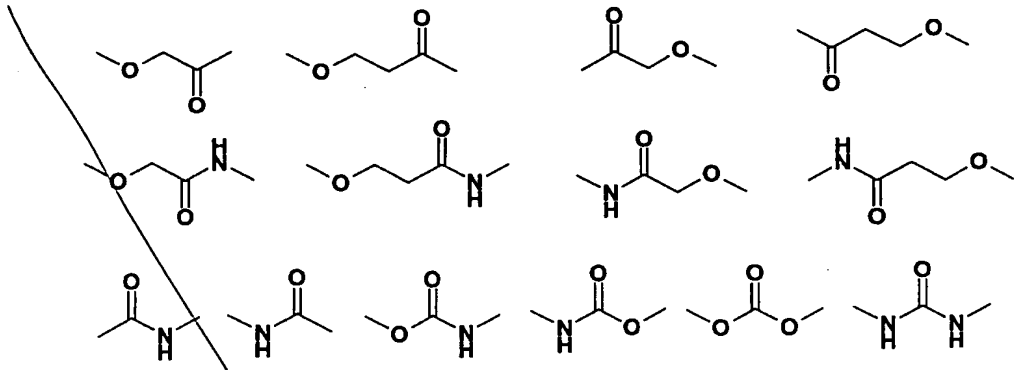
1,2-bis[4-(4-aminomethylbenzylaminocarbonyl)-1-piperazinylcarbonyl-1-oxyprop-2-ynyl]benzene;

1,3-bis[4-(4-aminomethylbenzylaminocarbonyl)-1-piperazinylcarbonyl-1-oxyprop-2-ynyl]benzene;

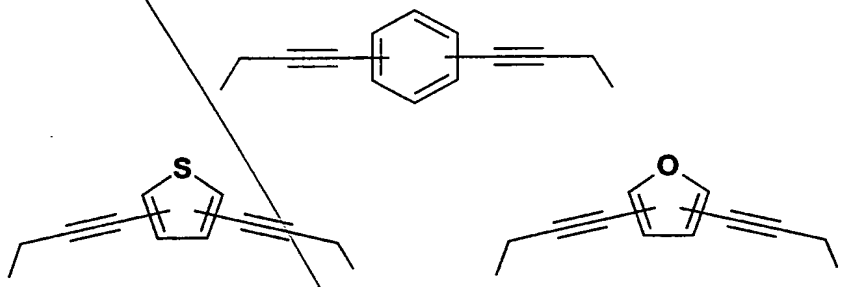
and the salts of these compounds.

6. Compounds of formula I according to claim 1 in which

-B1-A1-B3-A3-B5-A5- and -B2-A2-B4-A4-B6-A6- are identical or different and are selected from the groups below



M is a central building block selected from the groups below



K1 is -B7-$(C(O))_m$-B9-Y1 or -B7-$(C(O))_m$-B9-Z1-B11-X1,

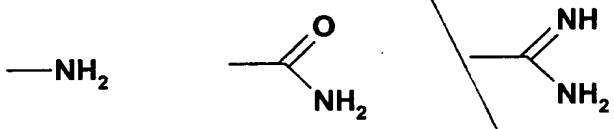
K2 is -B8-$(C(O))_p$-B10-Y2 or -B8-$(C(O))_p$-B10-Z2-B12-X2,

B7, B8, B9, B10, B11 and B12 are identical or different and are a bond or 1-2C-alkylene,

m is 0,

p is 0,

X1 and X2 are identical or different and are selected from the groups below



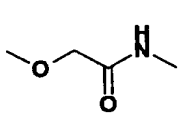
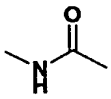
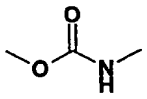
Y1 and Y2 imidazol-1-yl,

Z1 and Z2 are identical or different and are 5,2-pyridinylene, 6-methyl-5,2-pyridinylene, 4,1-piperidinylene, 3,6-indazolylene, 3,6-indolylene, 1,3-phenylene, 1,4-phenylene, 1,3-cyclohexylene or 1,4-cyclohexylene,

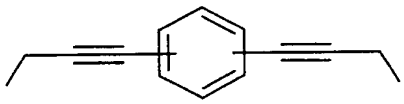
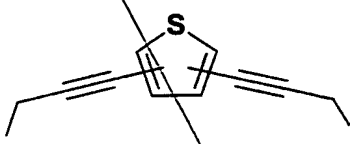
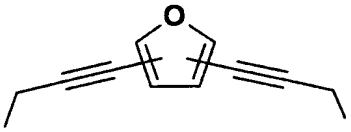
and where on the direct route between the terminal nitrogen atoms 20 to 33 bonds have to be present, the salts of these compounds, and also the N-oxides of the nitrogen-containing heteroaryls, heteroarylenes and heterocycloalkylenes, and their salts.

7. Compounds of formula I according to claim 1 in which

-B1-A1-B3-A3-B5-A5- and -B2-A2-B4-A4-B6-A6- are identical or different and are selected from

M is a central building block selected from the group below

K1 is -B7-$(C(O))_m$-B9-Z1-B11-X1,

K2 is -B8-$(C(O))_p$-B10-Z2-B12-X2,

B7 and B8 are identical or different and are a bond or methylene,

B9 and B10 are a bond,

B11 and B12 are methylene,

m is 0,

p is 0,

X1 and X2 are amino,

Z1 and Z2 are identical or different and are 1,4-phenylene or 1,3-phenylene,

and the salts of these compounds.

8. Compounds of formula I according to claim 1 with the chemical name

1,3-Bis-(4-aminomethylbenzylaminocarbonyl-1-oxyprop-2-ynyl)-benzene;

1,2-Bis-(4-aminomethylbenzylaminocarbonyl-1-oxyprop-2-ynyl)-benzene;

3,4-Bis-(4-aminomethylbenzylaminocarbonyl-1-oxyprop-2-ynyl)-thiophene;

2,5-Bis-(4-aminomethylbenzylaminocarbonyl-1-oxyprop-2-ynyl)-furan;

2,5-Bis-(3-aminomethylbenzylaminocarbonyl-1-oxyprop-2-ynyl)-furan;

3,4-Bis-(3-aminomethylbenzylaminocarbonyl-1-oxyprop-2-ynyl)-thiophene;

1,4-Bis-(4-aminomethylbenzylaminocarbonylmethyl-1-oxyprop-2-ynyl)-benzene;

1,3-Bis-(4-aminomethylbenzylaminocarbonylmethyl-1-oxyprop-2-ynyl)-benzene;

1,4-Bis-(4-aminomethylbenzylcarbonyl-1-aminoprop-2-ynyl)-benzene;

1,2-Bis-(4-aminomethylbenzylcarbonyl-1-aminoprop-2-ynyl)-benzene;

1,4-Bis-(4-aminomethylphenylethylcarbonyl-1-aminoprop-2-ynyl)-benzene;

and the salts of these compounds.

Sub A1

9. A medicament comprising one or more compounds of formula I according to claim 1 together with customary pharmaceutical auxiliaries and/or excipients.

10. Use of compounds of formula I according to claim 1 for the production of medicaments for the treatment of airway disorders.